Cancer in New Zealand.

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Geraldine.

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Cancer in New Zealand.

The climate of New Zealand and the general conditions of life tend to a very low Death rate from all diseases, in fact the death rate of I0.95 per I000 persons was the low--est recorded death rate for any country in the year I907. and even this rate was higher then any preceding year since I883.

Despite this favourable record there are two diseases, Tuberculosis and Cancer, which appear to be undoubtedly upon the increase, although, no doubt, many cases of the former complaint are imported into the country, yet more then half the cases registered as "Death from Phthisis" were born in the Dominion.

Of the cases of Cancer nearly all originated in this country. During the year I907 there were 674 deaths from Cancer, 6.70 per cent of all the deaths registered were due to Cancer in some form.

A decennial table shows that the deaths from Cancer per I0,000 persons rose from 6.40 in I898 to 7.33 In I908

In New Zealand, in contrast to England, the rate of mort--ality is higher among Males than Females, although in England there is an increasing rate among Males which, the Registrar-General calculates will make the mortality in both sexes equal about the year 1932, provided that the present rate of increase is maintained.

In offering this Thesis I shall refer chiefly to cases of Cancer that have occurred in the District of Canterbury, in which I have practised for a number of years, nearly all the cases being known to me personally and many of them having been attended by myself.

All the cases were apparently leading healthy lives under very favourable climatic conditions.

Several occurred in one particular district which, from the prevalence of this disease, is warning a very unsavoury reputation from a health point of view.

Unfortunately no very definite cause can be assigned for this peculiar local prevalence, but I shall venture to suggest some possible causes which appear to be common to all the cases.

Locality of Disease.

Throughout New Zealand the most common site of Carcinomatous invasion is the Alimentary tract, the Stomach being the organ most frequently attacked in both sexes.

Amongst Females the organs of generation suffer most, while

while

the Tongue, Lips, Throat are not affected to nearly the same extent that prevails in the Male sex, 7.2 out of every I00 deaths from located Cancer amongst Females as contrasted with 30.3 out of every I00 Males dying from the same cause in a five years mortality.

The following table shows how the different parts of the Alimentary tract are affected.

Part affected.	1903.		1904		1905		1906		1907	
	MALES.									
	Number of Deaths.	Proportion of Specified.	Number of Deaths.	Proportion of Specified.	Number of Deaths.	Proportion of Specified.	Number of Deaths	Proportion of Specified	Number of Deaths.	Proportion of Specified.
		Per cent		Per cent.		Per cent		Per cent.		Per cent
Mouth, Lips, Tongue. Throat. Neck.	99	33.56.	99.	32.46.	79.	26.69.	94.	31.02.	92.	28.05
Stomach.	96	32.54.	107	35.08	107.	36.15.	104.	34.33.	98.	29.88
Intestines. Rectum.	35	11.87	34.	11.15	29.	9.80.	35	11.55	49.	14.94
Liver.	35	11.87.	42.	13.77	49.	16.55.	44	14.52.	58.	17.68

Age & Period.

Deaths from Cancer begin to become numerous at the age of 35 in the Male, and at 30 in the Female sex.
The maximum number od deaths is reached between 60 and 65 years for Males and between 55 and 60 for Females.
Cancer in young children is rare.

In Canterbury the total number of deaths were

In I906. .....II4
I907 .....I55
Children under 5 years.....2

In Westland.

In I906.....I9.
I907. .....I6

In Otago.

In I906.....I40 (2cases under 5 yrs)
I907.....I45 (I case under 5 yrs.)

The following is a list of cases most of which have been under my own care.

List of Cases of Cancer.

No.	Initials.	Sex.	Age.	Seat of the Disease.
I.	J.	M.	55	Bowel.
2.	J.R.	M.	65.	Bowel.
3.	R.	M.	56.	Bowel.
4.	C.H.	F.	55	Bowel.
5.	J.	M.	65.	Liver.
6.	R.R.	M.	65.	Mouth & Throat.
7.	C(i)	M.	45.	Stomach.
8.	S.R.	M.	86.	Stomach.
9.	I.	F.	49.	Bowel.
I0.	A.	M.	49.	Bowel.
II.	C.	F.	56.	Breast.
I2.	M.	F.	5I.	Caecum.
I3.	H.	M.	48.	Epithelioma removed before Cancer develpped properly. (report of the Government Pathologist)
I4.	A.	M.	70.	Lip. (later Bladder & Rectum)
I5.	C (2)	F.	46.	Breast first. later Liver
I6.	T.	M.	70.	Rectum.
I7.	G.	F.	59.	Breasts.
I8.	D.	M.	57.	Bowel.
I9.	S.	M.	70.	Stomach.
20.	W.	F.	57.	Breasts.
2I.	Mc.	F.	5I.	Breasts.
22.	Col.	F.	46.	Liver.
23.	Co.	F.	62.	Uterus.
24.	M.	M.	72.	Bowel.
25.	D.	M.	56.	Bowel.
26.	Col.	F.	57.	Liver.
27.	Gr.	F.	39.	Liver.
28.	Ma.	F.	70.	Liver.
29.	Ma(2).	F.	53.	Pancreas.
30.	P.	M.	43.	Rectum.
3I.	H.	F.	70.	Breast.

From the above table it will be seen at a glance how Cancer in some part of the Alimentary tract is more common than in all the other organs of the body.

In the Male sex,at any rate,no fewer than Sixteen of the cases were in the Alimentary tract, Thirteen are recorded as occurring in the Bowel,the exact position being in many cases the Caecum,Splenic Flexure or Descending Colon.

Two cases were Rectal,and in a third the Rectum became involved from the Bladder.

Four cases were certified as Cancer of the Liver, and one case as Cancer of Liver secondary to Cancer of the Breast.

Two were distinctly Gastric in origin, One case of the Mouth and Throat, and One a doubtful case of Epithelioma of the Lip,which was removed and examined by the Government Pathologist who stated that the growth was "not at present Carcinomatous."

Among the Female cases the Breast was affected in the great majority of cases.

The average age for the Male cases was....61

The average for the Female cases was.....54.

Considering that by far the greatest number of these cases was an intestinal infection, it points to an exciting cause peculiar to all the cases.

I Intend therefore,to classify them as much as possible with

reference to the districts and houses in which they lived, the places where they worked, and the environment common to nearly all the cases.

Many of the cases were confined to one particular area, and several of them occurred within a few miles of each other. I shall try to briefly describe the nature of the district with its various characteristics.

District.

Between the large snow-fed river Rangitata and the smaller Orari lies a flat tract of country extending in length for about Ten miles to the foot of a hill 5,700 feet in height. The base of the hill was formerly, and is still to some extent, covered with dense native bush.

The breadth of the land varies, being about six miles across on the average, the lie of the land sinking slightly towards the middle, then gradually rising towrads the base of the mountain in which there are many gullies still showing some native bush.

Originally this land was covered with tussock (the native grass) and in the more swampy parts, with native flax and "nigger heads" and in many places it was difficult or impossible or difficult to cross.

The soil varied in many places from a light shingle to a stiff clay, the latter holding the water and "baking" in hot weather. The nature of this country is now entirely changed, the land being divided into farms and these subdivided into paddocks and ploughed in many instances, Cereals and turnips being the chief crop.

Many belts of Pinus Insignis and blue gums have been planted round the homesteads & willows have been planted all along the creeks. My only reason for referring to the district during its transition stage is because many of my patients lived in the country during this period and several of them worked and assisted to bring the land into its present cultivated condition.

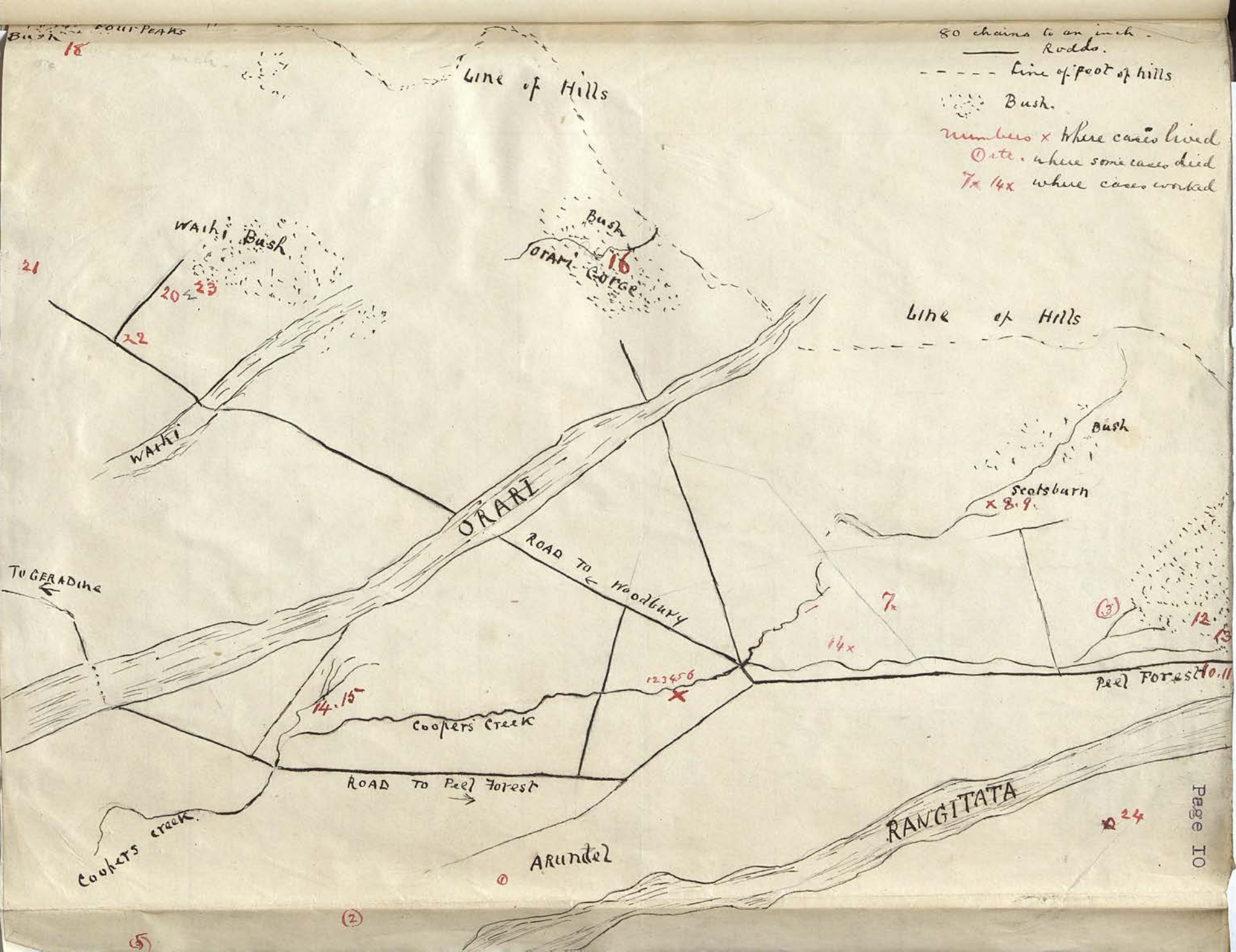
Creek.

Arising in the heart of the native bush in Peel Forest is a creek which winds throughout this area at a sluggish pace. in many places confined to its bed by well-defined banks, in others spreading widely over the land and irrigating the surrounding country during times of flood.

After flowing for some five miles it is joined by a second creek of mush the same character which rises in the wooded gullies in the hills.

Four miles lower down a third creek joins the main stream the latert stream arising in land that was formerly a swamp in the pre-cultivation stage.

It is in this district and especially along the line of the creek that most of the cases of Cancer have occurred, the actual situation of the patients residences being marked on the accompanying map.


80 chains to an inch.
Roads.
Line of foot of hills
Bush.
numbers × where cases lived
① etc. where some cases died
7× 14× where cases worked
Bush
FOUR PEAKS
18
Line of Hills
WAIHI Bush
21
20
23
22
Bush
ORARI GORGE
16
Line of Hills
WAIHI
ORARI
ROAD TO Woodbury
Bush
Scotsburn
× 8. 9.
TO GERALDINE
7×
③
12.
13
14×
123456
14. 15
Coopers Creek
Peel Forest
10. 11
ROAD TO Peel Forest
Coopers creek
ARUNDEL
①
RANGITATA
24
(2)
(5)

Rainfall.

The average rainfall for the year is over 45 inches. The altitude of the district above the Sea is 600 feet, The temperature ranges are never very severe although frosts are keenly felt owing to the fact that the flat ground holds the moisture and any snow falling tends to lie for some time. In Summer the maximum temperature is rarely over 90 degrees and this only occurs during a very hot and dry seas--on. Four miles away, across the Orari river, at a higher altitude, therainfall is as follows.

Rainfall at Orari Gorge. New Zealand.
Altitude of 800 feet above sea level.

	I899.	I900.	I90I.	I902.	I903.	I904.	I905.	I906.	I907.	I908
Jan.	4.I8	3.50	6.20	3.78	4.79	4.26	6.68	4.8I	3.05	2.I8
Feb.	5.43	2..62	5.I3	6.35	4.2I	6.97.	5.76	5.6I	7.03	I.33
March	8.62	3.I7.	4.70.	I4,77	2.5I	8.69	I.76	3.47	5.94	7.67
April	5.66.	5.4I	2.25	5.97	I.26	2.56	2.09.	4.33	2.56	3.55
May.	3.89	2.29	I.94	2.52	3.24	3.44	3.05	2.I9	2.39	3.38
June.	.76	I.00	2.06.	4.70	I.54	3.52	5.I3	3.96	I.39	-----
July.	4.94	2.92.	4.43	0.88	5.II	I.92	5.66	I.54	I.44	----
Augt.	I.26	2.48	I.88	0.89	2.23	I.95	2.33	2.00	5.84	---
Sept.	3.I3	5.52	2.I7	2.89	3.39	6.29	9.65	4.6I	5.48.	---
Oct.	.98	I3.I2	2.08	3.05	2.I2	8.87	5.8I	.66	2.89	--
Novr.	4.I2	3.92.	4.35	3.8I	4.8I	2.27	I.7I	4.I7	3.67	--
Dec.	4.30	3.I7	9.33	7.52	2.79	5.37	4.8I	I.59	I.47	--
Totals.	47.26..	49.I3	46.62	57.I4	38,00	56.II	54.54	38.94	43.I5	

Locality where cases occurred.

Many of these cancer patients inhabited the same house for a longer or shorter period,and although none actually died in this house and several lived some years after leaving the house, they were all working either in some part of the district or close to it up to the time of their death. Thus Cases, I,2,3,4,5,&6, all lived in the same house and though many remained in good health for some years after changing their residence,they all connected this district with their disease.

The particular cottage was a simple wooden structure built in the usual style of New Zealand houses,and was used as a shepherds home for the sheep station on which it was situated. Of the six cases mentioned above,Five died either in or close to the district. The sixth patient died at a distance.

The position in which these patients were residing at the time time of death are marked (I) &c on the map.

No. 7 worked for many years ploughing and "contracting" in in the district,dying eventually of Cancer of the Stomach at his farm seven miles distant.

Nos. 8 and 9. lived at Scotsburn a few miles distant,the house being situated on the banks of a branch of the notor--ious creek and lying at the foot of the hills with some native bush in the vicinity. (Cause of death. Cancer of Bowel

No. IO (Cancer of Bowel) No.II. (Cancer of Breast) No.I2 (cancer of Caecum) and No.I3 Epithelioma of Lip) all lived in the township of Peel Forest situated on the main branch of the creek and lying at the base of the high hills and in the native bush.

No. I4 (Epithelioma of Lip) removed three times, the last operation being twenty years ago, has now died of Cancer of the Bladder & Rectum. He lived on another branch of the creek but worked in all parts of the district for thirty years.

No. I5. Cancer of Breast & Liver, lived in the same house as No. I4 until her marriage.

No. I6 Cancer of Rectum, lived just across the Orari River, the house being situated in a hollow and with thick native bush burrounding the house. A small stream rising in the bush ran past the house.

Case, No. I7. Cancer of Breasts, lived for some years at Woodside,her house being situated at the foot of the hills surrounded by native bush, a stream rising in this bush ran past the house. This case died in Geraldine.

Case. I8, Cancer of the Bowel, lived at Four Peaks, the house was under a hill, in the bush,and a bush stream ran close to the house.

Case I9. Cancer of the Stomach, lived in the same house as Case I7, for many years. He did not die for ten years after leaving the house.

Cases 20 ,2I, 22, and 23, all lived at Waihi,a small township Three miles from the base of the hills and formerly surrounded with thick bush.

Case 24. (Cancer of Bowel) lived on the same side of the Rangitata but many miles distant,he died on the opposite side of the river. His house was placed in a hollow and the water supply came from a creek which rose in a hollow in a swamp behind the house.

Cases 25 to 30 all died in Geraldine, ten miles from the foot of the hills. Originally there was a great deal of native bush above the town,and the swampy ground was covered with native flax,and was drained by several creeks.

The home of Case 30. was on the banks of one of these creeks ,this area is now quite changed the bush having been cut down and the land drained.

Occupations.

All those affected with the disease were apparently leading a healthy out-of-doors life. The only patient who lived an in-door life was Case 30. but he spent much of his time in the open air.

Cases Nos. I,2,3,4,5,&6. were agricultural labourersand farmers.

Cases Nos. 7 and I4 were Contractors and farmers.

Case IO was a blacksmith.

Cases Nos. II and I2 were Housewives

Cases Nos. I5, I7, 20, 2I, 22, 23, 29, 28, & 49 4 and 9.
were engaged in domestic duties.
Cases Nos. I6, I9, 24, were runholders.
Case No. 30 was a draper.

Relationship.

In order to eliminate as far as possible any hereditary tendencies,it is only right to consider any relationship that existed between these different patients.
Case No. I4 was the Father of Case No. I5..
Case No.7. was the husband of I5.
Case No. 6 was the son of Case No.8.
Case No. 28 was the Mother-in-law of Case No.29.
Case 3I was the Aunt of Case I5.
Thus the cases, Nos. 6,8,I5,3I, were the only ones in which blood-relationship existed.

History of drfinite injury.

In many of the cases a distinct history of injury or of a long-standing irritation appears to have acted as a pre--disposing cause,the causes being always present in the patient's mind as the cause of the cancerous invasion.
The Case of 7(C) of the Stomach was attributed to an accident due to a horse falling upon him and injuring him in the region of the stomach,this however occurred five years before the nature of his disease was diagnosed,the man going

going--
about his usual work and only occasionally feeling any pain although he suffered greatly from Dyspepsia.

Case.No.I5. Cancer of the Breast ,This woman was the wife of the last mentioned case (No.7.) She developed Cancer within one year of her husband's death,and at first sight one was half inclined to attribute the disease to the direct contact with her husband, but enquiry proved that she had sustained a severe blow on the breast,by a kick from a sheep at least three years before the onset of the disease.

Case 24, C, Cancer of Bowel affecting the Splenic flexure, A history of injury to the side while moving sheep was obtained, the injury occurring some ten years before the fatal illness, but the side had always felt weak since the injury.

Case I4. Epithelioma of the Lip, the usual cause of continued smoking, the pipe being held on one side of the mouth. The growth was removed three times with many years between each operation,finally remaining clear for twenty years, when the disease appeared in the bladder from which a walnut sized tumour was removed by Dr. Fenwick of Christchurch, later the Rectum became affected.

Case No13. Epithelioma of the Lip (doubtful) The trouble originated from the practice of continually holding nails in the mouth when at work,these acting in the same way as a pipe stem as an irritating cause.

Case 4. Cancer of Rectum. This patient for long suffered from Piles which were irritated by riding on a bicycle.

Case 8. Cancer of the Bowel. A history of injury to the side was given,caused by a throw while wrestling,leaving a weakness all his life.

Case I6. Cancer of the Rectum gave a history of Piles.

Habits of the Patients.

As a general rule all the persons affected led a healthy open air life. With regard to their diet,they were all large and in some cases, great,meat-eaters.

They were all in the habit of drinking tea with their meal and frequently drank tea between meals also. The tea in most cases was taken very strong and often drunk out of a tin pannikin,the tea having"stood"in the pannikin for some time. As a general rule meat was eaten three times a day

Case.I. In addition to excessive tea drinking,alcohol was taken freely and later "pain-killer" was used in large quantity.

Case 2. An excessive tea drinker and smoker.

Case 6. Heavy smoker and drinker.

Case 8. Excessive drinker of tea.

Case IO. Excessive tea drinker, also indulged in Alcohol at times.

Case I4. Excessive tea drinker and smoker.

Case 11. Took Alcohol and tea freely.

Case I6. Excessive tea drinker

Cases 5, 24, 29, 30, All were excessive tea drinkers.

Many of the other patients doubtless indulged freely in tea drinking,but the eleven cases quoted above may be said to have been immoderate in their indulgence in tea.
It must be noticed that out of the eleven cases there were only Two Female patients,proving that in this country excessive indulgence in Tea is commoner among Males than Females, in marked contrast to the practice in England.
Although there was no actual Malarial fever endemic in the district many of the cases suffered from subacute and chron--ic Rheumatism and what is called "low fever",especially those who worked on the ground before it was drained.
At Ross on the West coast of the South Island, Dr Brittin found much the same conditions as regards diet,existing in the mining camps. On this coast the rainfall is very heavy and nearly the whole population suffer from chronic rheumatism. The staple diet among miners consists of "Frying-pan meat" and "billy" tea,the tea leaves being stewed in a"billy" pannikin and being removed once a week the weekly "clean up " showing signs of corrosion in the pannikin. The water usdd to make the tea showed the pres--ence of Iron and Tannin from decaying vegetation in the Bush streams.
Dr Brittin's statistics shew that during three years practice on the West Caost he had 35 deaths, of these 20 were under the age of Nine years. Of the remianing I5 which occurred between the ages of I0 and 78 years , Five were due to Cancer.

Of the Cancer patients, Four were males,aged 53, 53, 63, 59, years respectively and One Female aged 62.years.

Dr Brittin in a private letter, says "In Three yaers practice on the Coast I had Five cases of Cancer out of I5 deaths over I0 years of age, Four were cancer of the Liver or Duodenum, and one was a cancer of the Orbit. In I0 years practice on the East Coast I have had One death out of 70 from other causes.

In the early days of New Zealand much the same class of diet was taken throughout the country,practically no fish or fresh vegetables being available for food. This is now entirely altered and an employer of Labour amongst innumerable other duties to his down trodden employes, has to provide vegetables, Jam, and other luxuries.

Theories as to the cause of Cancer

Of late years so much has been written upon the subject of Cancer and so many theories have been propounded as to its Etiology that without certain knowledge ,after which we are all striving,and alas so far have striven in vain, it is a difficult matter to advance anything novel.

The old theory of irritation and external violence will, I think,still go far to account for the initial invasion of carcinomatous disease. That Cancer is,generally speaking, a disease of decaying tissues or rather of aged tissues, and so is more apt to occur in persons who have passed middle life,is admitted by all.

Whether our present day preventive and Sanitary legislation wherby hundreds of consumptives are saved to grow up with tissues below par and who are liable to early senile changes may have something to do with the apparent increase of Cancer is only a matter of conjecture. The effects of Alcohol and Syphilis in causing early degenerative changes both in parents and children must not be lost sight of.
At present we are apt to look for a solution of the problem in the Parasitic theory, or other theoretical soltion such as isolated remnants of Embryonic tissue remaining in the adult or possibly a geographical explanation such as Haviland's may find favour.

Haviland's Theory. Geographical distribution.

Nearly the whole of Wales and the North-west parts of England show a low mortality from Cancer. These parts belong to the oldest, the Silurian and Carboniferous systems, and physcially include the highest and best drained district in the country, The high mortality groups, or Cancer fields are seen in almost every case to surround the great rivers, after their full formation, and when they have reached the low-lying valley land liable to floods.
Thus we have the cancer field of the Thames London clay, of East Yorkshire, traversed by the Humber, In Suffolk the riparian districts of Bury St. Edmunds etc, Cumberland field following the River Eden and Valley of the Derwent, the soil

soil--

near Carlisle is clayey, alluvial and often flooded.
The Cancer fields in England are found in the sheltered low lying vales traversed by fully formed rivers and having sites liable to floods and composed of the more recent geological formation in which clays predominate.
The chalk county of Hampshire is remarkably free from Cancer The rivers rise in the chalk hills and are not ,as a rule, liable to swell suddenly and overflow their banks.

Cancer Houses.

D'Arcy Power gives several instances where several persons living in the same house have developed Cancer.
Thus in a brick house on land formerly pasture land three cases following each other died of Cancer.
Several other cases are recorded. In some however the cases were related . In my list of cases, I to 6, all lived at some time or other in the same house and were exposed to the same conditions of life, although none of them happened to die in this particular house. Marshy ground where streams arise appear to have some causal connection with the disease.
In Jamaica and on the East coast of Africa where Malaria is common, Cancer is rare.. Probably there is no real antagon--ism between Malaria and Cancerous infection of the suggest--ion of an antagonistic malarial poison is interesting in the light of our later knowledge of antitoxin serums.

Irritation Theory.

More cases of Cancer appear to be traceable to a long contin--ued course of irritation than to any other cause.
The frequent cases of Epithelioma of the lip due to smoking hot or dirty pipes, Cancer following gall-stones, Cancer of the Thigh (Kagri or burn disease) seem frequently in India due to the irritation of the portable charcoal basket which is carried next to the bare thigh in cold weather, Sweep's cancer due to the irritation of the soot in the folds of the scrotum,are all excellent examples of Carcimoma developing in tissues that have been subjected to long standing irritat--ion. Dr Fells found that out of 377 cases of cancer ~~of the buccal cavity~~, 91.5 per cent were connected with the buccal cavity. Captain Whitlock. R.A.M.C. observed that in 201 cases of Epithelioma of the Penis , all the patients were Hindoos who are not circumcised and no case occurred in Mahommedan patients who are always circumcised.
Cancer of the Uterus and Vagina occurred much more frequent--ly among Hindoo women. Sarcomata affecting the lower extremities occurred more frequently among Hindoos than Mahommedans, the former going barefooted, the latter wearing shoes.
Against the Irritation theory it has been said that Cancer of the Penis occurs ,not in Stallions who have the irritation of coitus,but in geldings who have no coition. This fact may be explained by the irritation of dirt that accumulates under the "sheath". A well known horse dealer in this country

informs me that by daily cleansing the sheath a very marked improvement is seen in every horse.

The lower animals appear to be wonderfully immune from the disease,Cancer occurring very rarely in dogs and horses and with extreme rarity in cows,sheep, and pigs.

Hydatid disease so common in this country, semms in no way to predispose sheep to carcinomatous invasion.

Single Injury.

Some cases appear to arise after a single injury caused at some time antecedent to the first symptoms of Cancer.

For instance a young man received a severe blow in the Parotid region which caused a swelling ,this later developed malignant symptoms and death resulted in a few months.

In Cases. Nos. 7,8,I5, 24, the history of a single injury was obtained,the injury in some cases having occurred many years before the onset of the disease,suggesting that a latent period in the life history of Cancer may exist. These cases stated that an occasional feeling of weakness had been felt at the site of the injury but there was no pain or emaciation until the malignant symptoms appeared.

A Female, aged 59 years,Cancer of Liver, gave a history of a very severe injury in the region of the Liver I6 years before the malignant symptoms became established.

Theories.

From what I have already said it will be seen that most of my cases were situated on the banks of creeks and drew their

water supply from streams that either drained through marshy ground or more often from Bush creeks where the water is in a constant state of contamination from decaying vegetable matter from the fallen leaves.

In the Case of Patient No. I2, he stated that the water after standing, had an offensive taste. In Case No/. 24 the water was taken from a creek that drained a swamp. Although in most cases the water was boiled before use, it the analysis shows that it was far from fit to use.

By the map it will be seen how the cases occurred along Cooper's creek and also in the Bush at the foot of the hills where the land is much damper and the rainfall is heavier than in the plains . Dr Mason says, " Cases are most liable to occur in low-lying,sodden, illdrained districts especial--ly if a sluggish stream passes through the land."

This description would apply to the country I have described

Irritation theory:

I think that there can be little doubt that excessive tea drinking especially when combined with a liberal meat diet has an irritating effect upon the mucous membranes of the Stomach and intestines, causing chronic dyspepsia and acidity which probably played a part in stimulating new growth.

Dr Brittin after his experience on the West Coast ascribes the disease to "Chronic Rheumatism and constant drinking of strong "Billy Tea".

Analysis.

Report from the Government Analyst.

The Government analyst reported that the specimen of water from one branch of the Creek showed a marked reaction for the "Bacillus Coli"

"The presence of this bacillus indicates of course contamination with faecal matter,but his need not necessarily be human".

Insoector reports that "he could find no evidence of any household sewage getting direct access to the creek"

A.A.Bickerton. Govrenment Analyst. reports.

	Grains per gallon. A.sample.	B. sample
Volatile & Organic matter.	I.40.	2.24.
Sodium chloride.	0.69.	I.27
Lime.	I.40	I.I5
Sulphates, Silicates, & Iron , & Nitrates.	A trace.	A trace.
Phosphates & Sulphides	Nil.	Nil.
	Parts per million.	
Free Ammonia.	0.0I7.	0.056.
Albuminoid Ammonia.	0.002.	0.0I5.
Colour.	Clear.	Clear bro -wn.